

Next Total Eclipse of the Sun, G. E. Lumsden, F.R.A.S Scientific American

On the 28th of May next, sometime after local sunrise, the round black shadow of the moon, like a great arm, will sweep in out of space, coming into contact with the earth near the Revilla Gigedo Islands in the Pacific Ocean, about 500 miles south and west of California. With the tremendous initial velocity of about 100 miles a minute, the shadow cone will rush toward the mainland and enter Mexico near Cape Corrientes. In eight minutes it will have crossed the Rocky Mountains, where, flying from peak to peak and from valley to valley, the spectacle will be sublime, though lasting but thirty seconds. By 7.30 central standard time (or 8.30 Eastern standard time) it will have crossed the Gulf near the mouth of the Rio Grande and plunged New Orleans into sepulchral gloom.

For the purposes of anticipation and study, let us imagine ourselves to be members of a group of enthusiastic men, women and youths, not necessarily scientific or practiced observers, only anxious to see everything possible. We should be posted upon

the highest possible eminence, so as not to miss the tremendous impressions due to the sudden rushing upon us of the stupendous shadow. We ought to be in the centre of the ground over which the shadow will pass. If this position be near New Orleans, we shall have totality for seventy-seven seconds. If we are at Union Point, Green County, Georgia, the centre of the path in the United States, we shall have darkness for ninety-two seconds. If we are near the Atlantic coast, not far south of the city of Norfolk, we shall have one hundred and five seconds for observation. Let us assume that we have brought with us opera and field glasses, telescopes, spectroscopes, barometers, thermometers and well-regulated timepieces set to Washington, Greenwich and local times. Of course, we have notebooks, pads of drawing paper, cardboard, white and blackened, upon which have been laid down black disks, around which our artistic members, by rapid sketching with colored chalks, may draw the phenomena we shall see. We have candles and lanterns, the latter for use if wind arise. Of course, we have cameras and plates of various speeds and densities of coating. We have seen the beautiful photographs taken on the 22d of January, 1898, in India, by Mrs. E. W. Maunder, with a small camera having a one and a half inch lens, nine inches in focus, photographs due entirely to her own conception of what might be accomplished with such a camera, and which have proved to be of scientific value. The images were small, but from them excellent drawings have been made. We have everything in readiness. Instruments are mounted or suspended. Cameras have been focused, the most distant objects being used for the purpose. Thermometers have been placed so that we shall be able to take the temperature of the air and soil; we have been told off by our director, who has given each of us some special duty to perform, and who ought to have knowledge sufficient to tell us what to look for and to explain the various phenomena as they come under our notice. Timepieces and thermometers must be read; information as to exposing plates must be given; the moments of contact announced, and the seconds during totality called off in a loud voice. And though we are all assisting, we shall be able to see everything. Professional astronomers will not be so fortunate. They must be in constant attendance upon their instruments, and will probably work behind screens shutting them off from the world, so that their attention shall not be distracted.

From our calculations, we know when the various contacts will occur. The sun is about three hours high, and the sky clear. We are told that the edge of the lunar disk is all but touching the edge of the sun, but we cannot detect the presence of our satellite. It has been explained to us that the moon is really moving toward the east and at the rate of about half a mile per second, that the surface of the earth is carrying us toward the east at the speed of about twelve miles a minute, and that the shadow is approaching us from the west at the velocity of nearly one mile a second. During the hour and twelve minutes which must elapse between the first detected cutting by the moon into the sun's limb and totality, we shall have ample op-

portunity to observe and draw sun-spots and faculae, if any, to note down our impressions, to estimate the effect the gradual extinction of the direct solar rays is having upon objects around us, and the falling of the mercury in the thermometers. As totality approaches, we should be on the alert for the shadow bands which are usually present in bewildering variety a few moments before the face of the sun is hidden, pulsating, it is said, in a manner to suggest the throes of nature in dissolution, and as if conscious of impending disaster. Nor should we forget to notice the effects of increasing twilight upon animals, birds, insects and flowers. On such occasions, domestic fowls go to roost, birds return to their nests, butterflies act "as if drunk," deer run about in alarm, and flowers, such as crocus, tulips, anemones, gentians, hepatica, pimpernels, wood sorrel and wild geranium close, and a peculiar hush falls upon everything. At this moment attention must be given to the sun, or what is left of it, for we must see the splendid phenomena known as Baily's Beads, visible for an instant or two as the moon's advancing edge closes in upon the eastern edge of the sun, but visible again when the western edge of the moon moves forward just enough to allow the solar rays to glint round at us through the valleys among the lunar mountains.

But when warned by our director, every eye must be turned to the west, for whatever else we succeed in doing, we must not fail to see the lunar shadow as it approaches. We may not live long enough to witness another eclipse under such auspices. Let us make the most of this. Forbes, who observed at Turin the total eclipse of 1842, said that he was so confounded by the awful velocity of the shadow, which swept toward him from the Alps, that he felt as if the great building on which he was standing swayed beneath him and began to fall over in the direction of the coming gloom. The rapidity of its motion and its black intensity produced the sensation that something material was flying over the earth at a speed "perfectly frightful," and he involuntarily listened for the rushing noise of a mighty wind. Airy describes as "very awful" a shadow retreating away among the hills of Northern Spain. Other writers are no less dramatic in their accounts of these phenomena, and the tremendous impression they create. But when the shadow has come, and after we have recovered to some degree from the effects of shock, and of the sudden darkness into which we have been plunged, we must rivet our attention upon the sun, or rather upon the moon, around whose black disk by this time will have appeared the splendid phenomena associated with a total solar eclipse, seen in all its majesty. Striking indeed is the almost instantaneous substitution, as in a dissolving lantern, of one picture for another, the one showing the sky with the blackened sun like a blot upon it, the other showing the sky suddenly draped in the mantle of night, upon whose sable bosom glow planet, star and coronal halo, and also roseate jets of incandescent gaseous matter leaping upward from and falling back upon the sun.

Now we photograph, sketch and color most assiduously, not losing a single second. We lay down the positions of planets, comets, if any, and

of bright stars. The eclipse is taking place in the constellation of Taurus, between the fine red star Aldebaran and the Pleiades. We look to see whether Aldebaran is able to make its presence known by shining through the gauzy structure of the corona, and how many of the bright stars in Orion and other constellations can be detected. We glance about the horizon and note the rich color-tones, ranging from black, in the zenith, through browns, purples, crimsons and reds, to yellow lying along the rough sky-line thirty miles away, where the sun is still shining, though with a partially hidden disk. We notice the ashy tints around us, reflected in our own faces. But a sudden glow along the western edge of the moon warns us that totality has gone like a flash, and that we have time only for a quickly exposed photographic plate or two, and for watching another lovely dissolving view, the fading out of night before the returning glow of all-conquering day. Almost instantly the landscape brightens and becomes familiar. Not until now, as we feel the warmth of the solar rays, did we suspect a passing chill. New life throbs everywhere. The black lunar shadow has swept majestically by us and is already out on the Atlantic, rushing toward Europe. Its vast track behind us is sprinkled with thousands of people, spell-bound by the wondrous vision vouchsafed them by Nature, who, for a moment, as it were, has lifted but a corner of her robe and allowed them to gaze upon glories, the impressions of which will never fade from memory.